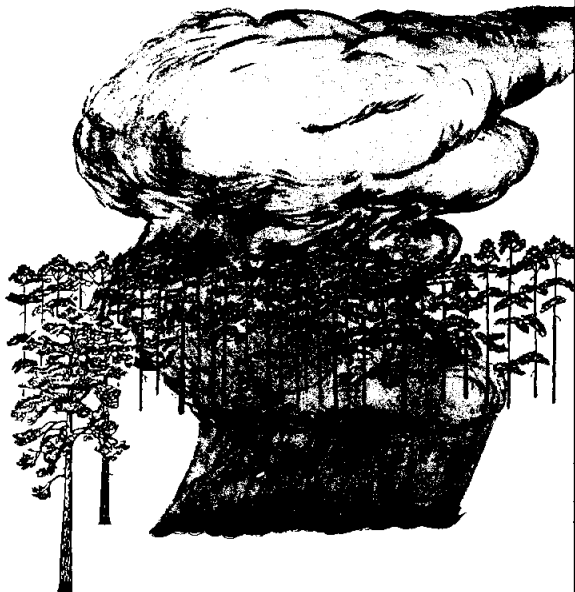


# LOUISIANA

## Smoke Management



## Voluntary Guidelines

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## **PREFACE**

The use of prescribed fire as a forest management tool has long been regarded as indispensable by the forestry community.

Annually, more than 500,000 acres are burned under controlled situations in Louisiana. Because of the cost effectiveness of prescribed fire, these acreages are expected to increase in the future.

In order to lessen the impact of smoke generated from prescribed burning on public health and welfare, the Louisiana Department of Agriculture and Forestry and the Louisiana Forestry Association developed these Voluntary Smoke Management Guidelines.

Application of these guidelines will minimize concentrations of smoke in sensitive areas and assist in maintaining air quality standards.

## **ACKNOWLEDGMENTS**

The Louisiana Forestry Association and the Louisiana Office of Forestry, Department of Agriculture and Forestry gratefully acknowledge the cooperation and assistance provided by the Arkansas Forestry Commission, Arkansas Forestry Association and the National Weather Service in preparing these guidelines.

# **LOUISIANA VOLUNTARY SMOKE MANAGEMENT GUIDELINES**

## **I OBJECTIVE**

The guidelines are intended to assure adherence to air quality regulations and manage smoke from forestry prescribed burning operations in such a way as to keep the smoke's impact on the environment within acceptable limits.

## **II CONTROL**

All burning in Louisiana is regulated by the Division of Air Quality, Department of Environmental Quality and the United States Environmental Protection Agency.

The State Forester has accepted responsibility for the dissemination and administration of a voluntary smoke management plan for burning that is related to forestry programs.

Nothing contained in this plan shall be construed as allowing any person to be in violation of any regulations, laws, ordinances or orders of the State of Louisiana or other governmental entity having jurisdiction or to relieve any person from the consequences of damages or injuries which may result from his/her burning activities.

## **III ADMINISTRATION, COORDINATION AND RESPONSIBILITIES**

### **A. Louisiana Office of Forestry**

The State Forester or his designee will administer this plan through the District Foresters of the Louisiana Office of Forestry (LOF). The State Forester will continue to coordinate all forestry burning with the Louisiana Department of Environmental Quality, Air Quality Division.

Primary responsibility at the district level for the coordination of prescribed burning activities shall be the District Forester's. He will designate a qualified individual or individuals (usually the Dispatcher) to perform the day-to-day activities, including routine retrieval of U. S. Weather Service data, calculation of Category Day (using formulas provided), and making a permanent record of the calculations.

## **B. Cooperator**

On the day of a prescribed burn, cooperators must inform the appropriate District Office\*, provide all required information (including how the cooperator's designee can be contacted at the burn site should sudden adverse weather conditions arise), and request information on the Category Day.

## **C. National Weather Service**

The National Weather Service will broadcast the Category Day on the National Oceanic and Atmospheric Administration (NOAA) Weather Channel.

Occasionally, during periods of relatively stagnant air, the National Weather Service at the request of the Department of Environmental Quality will issue an Air Stagnation Advisory (ASA) which requires a smoke management Category Day 1. When such an ASA is issued, the LOF District Forester's designee will notify the cooperators. Cooperators will not ignite new fires and will attempt to control any fires burning at the time the Air Stagnation Advisory is declared.

## **D. Designation of Smoke Management Category**

### **1. Baton Rouge Responsibility**

The Louisiana Office of Forestry, Baton Rouge Office, will receive the necessary smoke management forecast from the National Weather Service daily, and inform LOF District Offices of the Category Day. The information will not be provided on weekends, however.

### **2. District Office Responsibility**

The Louisiana Office of Forestry District Offices will receive the weather information from Baton Rouge

\* District Office phone numbers are listed in the appendix. Cooperators may obtain this forecast information and smoke management category by calling the Office of Forestry District Office.

Office before 9 a.m. each day. This forecast will then be relayed to all units of the Office of Forestry.

## **E. Training and Communications**

### **1. Louisiana Forestry Association's Responsibility**

The LFA, with input from the Regulatory Affairs Committee, will develop an implementation plan for the Voluntary Guidelines and promote an education and training program.

### **2. Cooperator's Responsibility**

The cooperators should provide education and training to assure that on-the-ground personnel understand the Voluntary Smoke Management Guidelines.

### **3. Louisiana Office of Forestry's Responsibility**

The LOF will incorporate smoke management training in its Fire Simulator Training Program that is available to employees of the agency and all cooperators.

## **IV. PROCEDURE**

When prescribed burning is to be used, the cooperator will take measures to keep the smoke's impact on the environment within acceptable limits. The recommended procedure to accomplish this objective follows a five-step screening system:

- A. Determine Category Day
- B. Determine Screening Distance
- C. Determine Trajectory of Smoke Plume
- D. Identify Smoke-Sensitive and Other Impacted Areas
- E. Evaluate the Results

In forestry prescribed burning it is recognized that numerous variables affect the fire behavior and resulting smoke. This system does not attempt to consider all the variables – it only offers the basic guidance.

### **A. Determine Category Day**

The cooperator will receive the fire weather forecast, cate-

gory day and surface inversion lifting temperature (SILT) from the nearest Louisiana Office of Forestry District Office. This information will be available by 9 a.m. each day. The LOF will determine the category day by the ventilation rate.\*

Category Day Guideline	Ventilation Rate
1. No burning	Less than 2,000
2. No burning until after 11 a.m. and not before surface inversion has lifted. Fire should be substantially burned out by 4 p.m.	2,000 - 4,000
3. Daytime burning only but not before surface inversion has lifted.	4,000 - 8,000
4. Burning anytime. For night burns, use backing fires with surface wind speeds greater than 4 mph.	8,000 - 16,000
5. "Unstable" and windy. Excellent smoke dispersal. Burn with caution.	Greater than 16,000

#### B. Determine Screening Distance

Place your planned burn into one of the four following categories:

1. Backing fire less than 1,000 acres
2. Head fire less than 1,000 acres
3. More than 1,000 acres
4. Piles/Windows

\* Ventilation rate is calculated by multiplying the afternoon mixing height in meters by the transport wind speed in meters per second. The minimum recommended mixing height (500 meters) and the minimum recommended transport wind speed (four meters per second) provide the minimum recommended ventilation rate ( $500 \times 4 = 2,000$ ).

The type of burn coupled with the category of burning day will determine the number of miles downwind from the burn for the screening process to apply.

Using the following table, find the block that represents the type of burn and category of day. The number in that block is the minimum number of miles downwind from the burn to screen for smoke sensitive areas.

Screening distance is the area to examine for possible smoke-sensitive areas such as airports, highways, communities, recreation areas, schools, hospitals, factories and nursing homes.

#### Type of Burn

#### Category Day

	1	2	3	4	5
<b>Backing Fire</b> less than 1,000	N O	MILES			
		10	5	2.5	.75
<b>Head Fire</b> less than 1,000	B U	20	10	5	.75
More than 1,000 acres in size	R N I	20	10	5	.75
Piles/Windows	N G	30	15	8	.75

#### C. Determine Trajectory of Smoke Plume

Locate burn on map and draw a line representing the centerline of the path of the smoke plume for distance. If burn will last three hours, draw another line showing predicted wind direction at completion of burn.

To allow for horizontal dispersion of the smoke, as well as shifts in wind direction, draw two other lines from the fire at an angle of 30 degrees from the centerline(s). If fire is represented as a spot draw as in figure A. If larger, draw as in figure B.

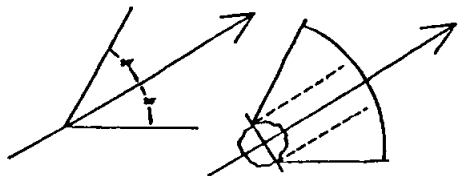


FIGURE A

FIGURE B

#### D. Identify Smoke-Sensitive and Other Impacted Areas (Targets)

Smoke-sensitive areas can be adversely affected by smoke. Examples are: Airports, highways, communities, recreation areas, schools, hospitals, nursing homes and factories. These areas are potential problems for smoke from your burn.

##### Using the Screen Distance from Step B

1. Determine smoke sensitive areas.
2. Recognize potential smoke sensitive areas that already have an air pollution or visibility problem.
3. Identify any potential area where emission of sulfur dioxide (SO<sub>2</sub>) merge with the smoke plume. (Present research indicates that SO<sub>2</sub> in the presence of particulate matter might be a health hazard.) Likely sources are smelters, electric power plants and factories where coal is burned.
4. Should other known sources of smoke overlap your trajectory toward a sensitive area, consider increasing the recommended screening distance. LOF should remain sensitive and advise cooperators of such known conditions.

#### E. Evaluate the Results

If you identify any areas in step D that could be adversely impacted by smoke production from your burn, either take necessary precautions or consider burning under more favorable conditions.

## GLOSSARY

**Air Stagnation Advisory (ASA):** A statement issued by a National Weather Service Forecast Office when atmospheric conditions are stable enough that the POTENTIAL exists for air pollutants to accumulate in a given area. The statement is initially issued when conditions are expected to last for at least 36 hours.

**Backing Fire:** The fire spreading against the wind or downhill. Flames tilt away from direction of spread.

**Category Day:** A scale from 1 to 5 based on ventilation rates. For smoke dispersal, 1 is poor and 5 is excellent.

**Cooperators:** Those forest land owners or managers who have agreed to carry out prescribed burning in such a manner to adhere to the Voluntary Smoke Management Guidelines.

**Heading Fire:** A fire spreading with the wind or uphill. Flames tilt in the direction of the spread.

**Inversion:** An increase of temperature with height in the atmosphere. Vertical motion in the atmosphere is inhibited allowing for pollution buildup. A "normal" atmosphere has temperature decreasing with height.

**LOF:** Louisiana Office of Forestry

**Meter (m):** Basic unit of length in the metric system; there are 39.37 inches/meter, 3.28 feet/meter, 1.1 yards/meter. Minimum mixing height of 500 meters = 1,640 feet.

**Meters Per Second (mps):** Expression of distance traveled each second. One meter per second is equal to 2.2 miles/hour. Minimum transport wind speed of 4 mps = 8.8 mph.

**Mixing Height:** Measured from the sea level upward, the height to which relatively vigorous mixing occurs due to convection. Same as mixing depth. Use of this term normally implies presence of an inversion and the base of the inversion is the top of the mixed layer and defines the mixing height.

**Particulate Matter:** Any liquid or solid particles. "Total suspended particulates" as used in air quality are those particulates suspended in or falling through the atmosphere. They generally range in size from 0.1 to 100 microns.

**Plume:** The segment of the atmosphere occupied by the emissions from a single source or a grouping of sources close together. A convection column, if one exists, forms a specific part of the plume.

**Prescribed Burning:** Controlled application of fire to wildland fuels in either their natural or modified state, under such conditions of weather, fuel moisture, soil moisture, etc. as allows the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to further certain planned objectives of silviculture, wildlife habitat management, grazing, fire hazard reduction, etc.

**Screening Distance:** The area to examine for possible sensitive targets.

**Sensitive Targets:** Areas that can be adversely affected by smoke. Examples: Airports, major highways, communities, recreation areas, schools, hospitals, nursing homes, factories, etc.

**Smoke Management:** Conducting a prescribed fire under fuel moisture and meteorological conditions, and with firing techniques that keep the smoke's impact on the environment within acceptable limits.

**Surface Inversion Lifting Temperature (SILT):** The ambient air temperature in which the surface inversion should lift.

**Transport Wind Speed:** A measure of the average rate of the horizontal transport of air within the mixing layer. May also be the wind speed at the final height of plume rise. Generally refers to the rate at which emissions will be transported from one area to another.

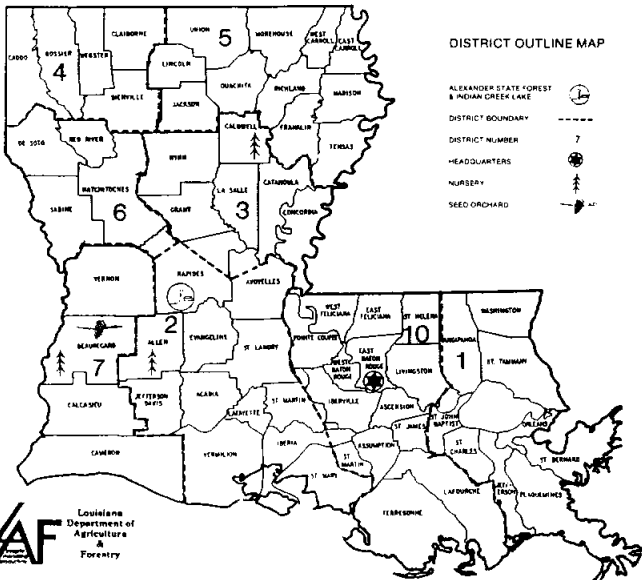
**Ventilation Rate:** The mixing height times the transport wind speed gives a rate indicating the capability of the lower atmosphere to diffuse and disperse smoke. Ventilation rate is calculated by multiplying the afternoon mixing height in meters by the transport

wind speed in meters per second. The minimum recommended mixing height (500 meters) and the minimum recommended transport wind speed (four meters per second) provide the minimum recommended ventilation rate ( $500 \times 4 = 2,000$ ).

**Warm Front:** The leading edge of a relatively warm air mass which moves in such a way so that warm air displaces colder air. Winds associated with warm frontal activity are usually light and mixing is limited. The atmosphere is relatively stable compared to cold-front activity.

**Wind Shear:** A variation in wind speed and/or direction in a layer of the atmosphere or between layers. The variation may be in the horizontal or vertical and may result in significant turbulence depending upon the magnitude of the wind speed/direction difference. A strong wind shear may act like an inversion and inhibit plume rise. It may also fracture the smoke plume, not allowing smoke to rise much above terrain levels. A strong horizontal anticyclonic shear results in a downward motion and may bring smoke aloft to the surface.





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